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The Lungworm *Spiculocaulus austriacus* (Gebauer, 1932) Dougherty and Goble, 1946 in Chamois *(Rupicapra rupicapra)* in Switzerland

by

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With 1 plate

ABSTRACT

The lungworm *Spiculocaulus austriacus* was recovered at autopsy from six of eighteen chamois from various regions of Switzerland. The results of morphometric and general structural examinations are presented and compared with those in previously published descriptions of the parasite. Particular attention is given to the perivulvar structures in the female and to the spicules in the male.

This is the first report of this lungworm from animals in Switzerland.

INTRODUCTION

Nine species of lungworm have been recovered from chamois in various parts of the world (HÖRNING & WANDELER 1968; BOEV 1975); *Spiculocaulus austriacus* was first described, and named *Protostrongylus austriacus*, from chamois in Austria by GEBAUER (1932). Subsequently, specimens have been recovered from a variety of hosts in several locations (BOUVIER & HÖRNING 1963): from chamois in Germany (STROH 1936) and the central Caucasus (PUPKOV 1971); from roe deer (*Capreolus capreolus*) and goats (*Capra* sp.) in Kazakhstan (BOEV & VSEVOLODOV 1939); from Asiatic ibex *(Capra sibirica)* in Kazkhstan (BOEV & SOKOLOVA 1949; BOEV 1957; BOEV *et al.* 1957) ,and in Kirghizia (GAGARIN 1960), and from Alpine ibex *(Capra ibex)* in Czechoslovakia (Guoth 1960) and in Italy (Balbo 1973). The species *Spiculocaulus andreevoi*, recovered from a goat by Boev & Murzina (1948) is generally accepted to be synonymous with *S. austriacus* (Boev 1975).

The morphological characteristics of *S. austriacus* are moderately well established, with the exception of the perivulvar structures in the female, which show some variation among individuals from the same and different host species (Gebauer 1932; Stroh 1936; Boev 1957). However, in the most recently published description, Boev (1975) considers these variations to be intraspecific.

This paper describes male and female specimens of *S. austriacus* from chamois in Switzerland.

MATERIALS AND METHODS

The parasites were recovered at autopsy from the tracheas and larger bronchi of eighteen chamois from various regions of Switzerland and were fixed and preserved in 70% ethyl alcohol. Temporary mounts in phenol alcohol (4 parts liquified phenol to 1 part absolute ethyl alcohol) were prepared for the microscopic examinations, which were carried out using either bright field or Nomarski interference contrast illumination. Measurements were made by means of a *camera lucida*. All the parasites recovered were examined and identified individually.

RESULTS

Adult *Protostrongylus rupicaprae* were found in sixteen animals and adult *Dictyocaulus filaria* in one. Adult *S. austriacus* were found in six animals (Table 1), five of which also contained *P. rupicaprae*. From these six animals a total of four male and eleven female *S. austriacus* were recovered, though only one male and three females were intact and several specimens were damaged, probably because of defects in the collection method. Only two animals contained both male and female *S. austriacus*. The other lungworm inhabiting the trachea and larger bronchi of chamois, *Gelanocaulus boievi*, was not found.

The morphometric results for adult female *S. austriacus* in previous reports (Gebauer 1932; Stroh 1936; Boev & Vsevolodov, 1939; Boev & Murzina 1948; Boev 1957, 1975)

Table 1.

Recoveries of S. austriacus *from chamois*

Reference number	Origin of chamois	*S. austriacus*	
		Males	Females
38665	Unknown	1	2
42689	Pontresina (GR)	1	0
52600	Leukerbad (VS)	1	0
53074	Diablerets (VD)	1	1
53506	Leukerbad (VS)	0	5
53680	Fionnay (VS)	0	3

are all very similar and our results (Table 2) compared well with those in Gebauer's original description of the species. Exceptions are some of the body widths recorded, which were lower for our specimens, perhaps because of the apparent collapse of areas of the pseudocoelom.

Table 2.

Morphometry of adult female S. austriacus

Morphological characteristic		Gebauer 1932	Polley & Hörning		
			Mean	Range	Number examined
Body length	(mm)	35-52	42	41-45	3
Oseophageal length	(mμ)	440-520	457	420-507	4
Maximum oesophageal width	(mμ)	70-90	64	53-73	3
Cephalic width	(mμ)	48-66	45	40-53	4
Body width at oesophageal end	(mμ)	120-160	97	80-127	4
Maximum body width	(mμ)	160-230	158	127-178	3
Body width anterior to vulva	(mμ)	120-135	118	100-134	11
Vaginal length	(mμ)	750-1150	770	607-1047	7
Length of anterior lobe of provagina	(mμ)	130	123	92-144	9
Length: vulva to tail	(mμ)	290-350	294	157-388	11
Length: anus to tail	(mμ)	120-130	107	77-142	11

Similarly, the general morphology, the characteristics of the mouth, oral cavity, oesophagus, nerve ring, excretory pore and anus, and the arrangement of the uteri, utero-vaginal junction, vagina and vulva of our specimens (Plate 1, *a*, *b* and *c*) were comparable with those in the previously published descriptions. However, though nine of our specimens each had a provagina as described by Gebauer (1932), two have instead a vulval bell (Boev & Vsevolodov 1939; Stroh 1936) (Plate 1, *d*).

As for the females, the morphometric results for adult male *S. austriacus* in descriptions by previous authors (Gebauer 1932; Stroh 1936; Boev & Vsevolodov 1939; Boev & Murzina 1948; Boev 1957, 1975) are all very similar. The results for our specimens (Table 3), which include only one complete parasite, were comparable with those of Gebauer (1932) and Boev (1957), excepting those for the spicules. The mean lengths of these in our specimens were less and in all three the right spicule was shorter than the left by about fifteen percent.

The general morphological characteristics of our specimens, including the structure and arrangement of the spicules, gubernaculum, telamon, chitinous cap and bursa, were also very similar to those in previously published descriptions (Plate 1, *e* and *f*).

DISCUSSION

This report extends the geographical range of *S. austriacus* in chamois. Though this lungworm was not found in earlier surveys of parasites of this host in Switzerland (Bouvier & Hörning 1963; Salzmann & Hörning 1974; Dollinger 1974), its occurr-

Table 3.

Morphometry of adult male S. austriacus

Morphological characteristic	Gebauer 1932	Polley & Hörning		
		Mean	Range	Number examined
Body length (mm)	20-32	29	—	1
Oesophageal length (mμ)	460-520	327	—	1
Maximum oesophageal width (mμ)	48-72	60	—	1
Cephalic width (mμ)	44-52	53	—	1
Body width at oesophageal end (mμ)	96-120	93	—	1
Maximum body width (mμ)	130-160	113	—	1
Body width anterior to bursa (mμ)	120-136	91	86-94	3
Spicule lengths:				
left (mμ)	960-1115	778	727-840	3
right (mμ)		665	613-714	3
Spicule stem diameter (mμ)	8	7	6-8	2
Spicule wing diameter (mμ)	8-12	7	6-8	2
Gubernaculum length (mμ)	111-142*	113	102-124	2
Capitulum length (mμ)	44-54*	29	27-31	2
Crurae length (mμ)	70-88*	76	68-81	2
Corpus length (mμ)	41-56*	39	34-43	2

* Results from Boev (1957), specimens from Asiatic ibex (*Capra sibirica*).

ence in the country is not surprising, for it has been recovered from chamois in Austria and Germany and from the Alpine ibex in Italy.

In some of our chamois very few *S. austriacus* were present among many *P. rupicaprae* and may be missed, for grossly the adults of the two species are very similar.

With regard to the perivulvar structures in the female, our material contained some specimens with the single-lobed vulval bell as described by Stroh (1936) (Plate 1, *d*) and other specimens with the two-lobed provagina as described by Gebauer (1932) (Plate 1, *a* and *b*). Boev (1957, 1975) also reported both types of perivulvar structure among material from an Asiatic ibex, and stated that the differences are due to intraspecific variation. This suggestion is supported by the apparent absence of any possibly matching males other than *S. austriacus* from the material examined by Boev, by Stroh (1936), or by us, though in only two of our animals were both male and female *S. austriacus* found. It will be necessary to examine more chamois before it can be decided with certainty whether these two types of female represent more than one species.

With regard to the spicules in the male, Gebauer (1932) states that they are equal in length but includes no illustrations. In their texts, Stroh (1936), Boev & Murzina (1948) and Boev (1957, 1975) do not comment upon relative spicule lengths; Stroh's drawings suggest that they are equal and Boev's that they are unequal.

In our specimens, particularly under low magnification, it was difficult to distinguish between the posterior ends of the spicules and of the crurae of the gubernaculum, which extend past the end of the spicules when these are retracted. Unless this distinction is made, it is possible to measure spicule lengths inaccurately.

The small numbers of *S. austriacus* found in our infected chamois suggest that it is unlikely to be of great pathological significance, but careful examination of the lungworms from this and other likely host species may show the parasite to be more common than is presently thought.

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ZUSAMMENFASSUNG

Bei 6 von 18 Gemsen aus verschiedenen Gebieten der Schweiz wurde der Lungenwurm *Spiculocaulus austriacus* bei der Sektion gefunden. Die Ergebnisse morphometrischer und allgemein-morphologischer Untersuchungen werden mit Beschreibungen des Parasiten in früheren Veröffentlichungen verglichen.

Es handelt sich um die erste Feststellung dieses Lungenwurmes in der Schweiz.

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PLATE I. — Morphology of *S. austriacus*.

(a to e: Nomarski interference contrast illumination
f: bright field illumination)
(each scale line represents 50 mμ)

a) Posterior end of adult female, lateral view, showing eggs in vagina, vulva, two-lobed provagina, anus and tail.
b) Posterior end of adult female, ventral view, showing vulva, posterior margin of anterior lobe of two-lobed provagina, anus and tail.
c) Anterior end of adult female, lateral view, showing mouth, oesophagus, anterior intestine and excretory duct and pore.
d) Posterior end of adult female, lateral view, showing vulva and single, anterior lobe of provagina.
e) Posterior end of adult male, dorsal view, showing posterior ends of both spicules, capitulum, corpus and crurae of the gubernaculum and the dorsal bursal ray.
f) Posterior end of adult male, dorsal view, showing unequal spicules, capitulum of gubernaculum, posterior chitinous cap and some elements of the copulatory bursa.